UCLouvain

ldats2310

2024

Deep learning for Insurance and Finance

3.00 credits	15.0 h	Q2

Teacher(s)	Hainaut Donatien ;
Language :	French > English-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Knowledge of basic concepts in statistics and probability calculation as well as programming, at the course level of the FSA1BA, INGE1BA, MATH1BA programs or the access minor in statistics, actuarial sciences and data science.
Main themes	Artificial neural networks, deep learning, auto-encoder, LSTM, convolution networks, pricing and forecasting
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 • Program a regression/classification artificial neural network for pricing or forecasting in insurance/ finance • Choose the calibration algorithm, the optimization criterion, as well as the constraints most appropriate to the data • Implement a neural network reducing the size of a dataset • Using a network to model time series
Evaluation methods	Students will prepare an individual report in which the methods seen during the readings are applied to a real data set. Note that the professor reserves the right to orally question students on the content of their work.
Teaching methods	• Reading with slides • Programs in Python (KERAS & TENSORFLOW) • Case studies
Content	• Neural networks (NN), general • NN for insurance and credit risk: deviance and personalized loss function, bias regularization. • NN and high dimension: ridge and lasso penalization as well as “embedding layers” • Bias-variance: bootstrapping, randomization drop-out • Interpretation of models: PDP, ICE, feature importance, LIME, SHAP • Neural autoencoders and variational autoencoders • Time series forecasting with recurrent networks and LSTM • Regression with convolution network
Inline resources	Moodle website
Bibliography	Denuit M., Trufin J. , Hainaut D. 2019. Effective statistical learning III : neural networks and extensions. Springer actuarial lectures notes.
Faculty or entity in charge	LSBA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	3		
Master [120] in Actuarial Science	ACTU2M	3		
Master [120] in Statistics: General	STAT2M	3		
Certificat d'université : Statistique et science des données (15/30 crédits)	STAT2FC	3		